February 17, 1842.

SIR JOHN WILLIAM LUBBOCK, Bart., V.P. and Treas., in the Chair.

Robert Edwards Broughton, Esq., was balloted for, and duly elected into the Society.

A paper was in part read, entitled, "On the Structure and Use of the Malpighian bodies of the Kidney, with Observations on the Circulation through that Gland." By William Bowman, Esq., F.R.S., Demonstrator of Anatomy in King's College, London, and Assistant Surgeon to the King's College Hospital.

February 24, 1842.

SIR JOHN WILLIAM LUBBOCK, Bart., V.P. and Treas., in the Chair.

The ballot for Major-General W. Morison, C.B., and Captain Owen Stanley, R.N., was deferred until the next meeting of the Society, there not being a sufficient number of Fellows present.

The following Meteorological Observations, taken in conformity with the Report drawn up by the Committee of Physics, including Meteorology, for the guidance of the Antarctic Expedition, as also for the various fixed Magnetic Observatories, have been communicated by the Lords Commissioners of the Admiralty and the Master-General of the Ordnance, viz.—

1. "Meteorological Observations taken on board Her Majesty's ship Erebus, for November and December 1840; and for January, February, March, April, May, June and July 1841." By Captain James Clark Ross, R.N., F.R.S., Commander of the Expedition. (*Forms* 1 & 2.)

2. "Meteorological Observations taken on board Her Majesty's ship Terror, for October, November and December 1840; and for January, February, March, April, May and June 1841." By Capt. T. B. M. Crozier, R.N. (*Forms* 1 & 2.)

3. "Meteorological Observations taken at the Magnetic Observatory, Cape of Good Hope, for February, March, April, May, June, July, August and September 1841." By F. Eardley Wilmot, Esq., Lieut. in the Royal Artillery. (*Forms* 1 & 2.)

4. "Meteorological Observations taken at the Magnetic Obser-

vatory, Ross-Bank, Van Diemen's Land, for April, May and June 1841." (*Forms* 1 & 2.)

5. The reading of a paper, entitled, "On the Structure and Use of the Malpighian bodies of the Kidney, with Observations on the Circulation through that Gland." By William Bowman, Esq., F.R.S., Demonstrator of Anatomy in King's College, London, and Assistant Surgeon to the King's College Hospital, was resumed and concluded.

The author describes the results of his examination of the structure and connexions of the Malpighian bodies of the kidney in different tribes of Vertebrata, and shows that they consist essentially of a small mass of vessels, contained within dilated extremities of the convoluted uriniferous tubes. The tubes themselves consist of an outer transparent membrane (termed by the author the *basement membrane*) lined by epithelium. This basement membrane, where it is expanded over the tuft of vessels, constitutes the capsule described by Müller. The epithelium lining the uriniferous tube is altered in its character where the tube is continuous with the capsule, being there more transparent, and furnished with cilia, which, in the frog, may be seen, for many hours after death, in very active motion, directing a current down the tube. Farther within the capsule the epithelium is excessively delicate, and even, in many cases, absent. The renal artery, with the exception of a few branches given off to the capsule, surrounding fat, and coats of the larger blood-vessels, divides itself into minute twigs, which are the afferent vessels of the Malpighian tufts. After it has pierced the capsule, the twig dilates, and suddenly divides and subdivides itself into several minute branches, terminating in convoluted capillaries, which are collected in the form of a ball; and from the interior of the ball the solitary efferent vessel emerges, passing out of the capsule by the side of the single afferent vessel. This ball lies loose and bare in the capsule, being attached to it only by its afferent and efferent vessel; and is divided into as many lobes as there are primary subdivisions of the afferent vessel; and every vessel composing it is bare and uncovered, an arrangement of which the economy presents no other example. The efferent vessels, on leaving the Malpighian bodies, enter separately the plexus of capillaries surrounding the uriniferous tubes, and supply that plexus with blood. The blood of the vasa vasorum also probably enters this plexus. The plexus itself lies on the outside of the tubes, on the deep surface of the membrane which furnishes the secretion; and from it the renal vein arises by numerous radicles.

Thus the blood, in its course through the kidney, passes through two distinct systems of capillary vessels; first, through that within the extremities of the uriniferous tubes; and secondly, through that on the exterior of these tubes. The author points out striking differences between these two systems. He also describes collectively

under the name of *Portal System of the Kidney*, all the solitary efferent vessels of the Malpighian bodies, and compares them with the portal system of the liver; both serving to convey blood between two capillary systems. In the latter, a trunk is formed merely for the convenience of transport, the two systems it connects being far apart. But a portion even of this has no venous trunk, viz. that furnished by the capillaries of the hepatic artery throughout the liver, which pour themselves either into the terminal branches of the portal vein, or else directly into the portal-hepatic capillary plexus. On the other hand, in the kidney, the efferent vessels of the Malpighian bodies, situated near the medullary cones, having to supply the plexus of the cones, which is at some little distance, are often large, and divide themselves after the manner of an artery. They are portal veins in miniature. In further confirmation of his view of the existence of a true portal system in the kidney of the higher orders of animals, where it has never hitherto been suspected, the author describes his observations on the circulation through the kidney of the Boa Constrictor, an animal which affords a good example of those in which portal blood derived from the hinder part of the body traverses the kidney. He shows that here the Malpighian bodies are supplied, as elsewhere, by the artery, and that their efferent vessels are radicles of the vena portæ within the organ, and join its branches as they are dividing to form the plexus surrounding the tubes; thus corresponding with the hepatic origin of the great vena portæ. In other words, the vena portæ is an appendage to the efferent vessels of the Malpighian bodies, and aids them in supplying blood to the plexus of the tubes. Thus in this variety of the kidney, as in the liver, there is an internal as well as an external origin of the portal system; while in the kidney of the higher animals, this system has only an internal or renal origin, viz. that from the Malpighian bodies.

A detail of the results of injection by the arteries, veins and ducts is then given, and they are shown to accord with the preceding description. Many varieties in the Malpighian bodies in different animals are also pointed out, especially as regards their size.

The author then proceeds to found on his previous observations, and on other grounds, a theory of a double function of the kidney. He conceives that the aqueous portion of the secretion is furnished by the Malpighian bodies, and its characteristic proximate principles by the walls of the tubes. After giving in detail his reasons for entertaining this view, he concludes by referring to the striking analogy between the liver and kidney both in structure and function, and by expressing his belief, first, that diuretic medicines act specially on the Malpighian bodies, and that many substances, especially salts, which when taken into the system have a tendency to pass off by the kidneys with rapidity, in reality escape through the Malpighian bodies; secondly, that certain morbid products occasionally found in the urine, such as sugar, albumen, and the red particles of the blood, also, in all probability, pass off through this bare system of capillaries.

This paper is illustrated by numerous drawings from injected and recent specimens.

March 3, 1842.

FRANCIS BAILY, Esq., V.P., in the Chair.

Major-General W. Morison, C.B., and Captain Owen Stanley, R.N., were balloted for, and severally elected into the Society.

A paper was read, entitled, "On the Diurnal Temperature of the Earth's Surface, and the discussion of a simple Formula for ascertaining the same." By S. A. Drach, Esq. Communicated by John Lee, Esq., LL.D., F.R.S.

The author observes, in his introductory remarks, that during a period of twenty-four hours the quantity of calorific rays emitted from the sun, and falling on the exposed atmosphere of the earth, is proportional to one day's area as swept by the radius vector divided by the square of that radius; or is proportional to the true angular motion for that day; which is equivalent to substituting the declinations resulting from the true longitudes for those deduced from the mean ones at mean noons. On the arrival of the rays at the superior limit of our atmosphere, they undergo refraction, absorption, and difficulty of conduction; and when arrived at the surface of the earth, they suffer radiation and reflection; the absorption alone, at a vertical distance, amounting to upwards of one-fourth. The maximum sensible heat, he proceeds to observe, appears to follow the sun in its diurnal revolution, being similar, in this respect, to the point of maximum tidal height of the ocean; hence he applies the term *thermal establishment* to the retardation of the effects caused by atmospherical conduction and localities, in the same manner that the term *tidal establishment* has been employed to denote the local constant by which the astronomical effects on the tides are delayed.

The tables annexed to the paper assume that the degree of the thermometer is proportional to the cosine of the sun's meridian altitude, commencing with that on the day of observation, and ending with the altitude thirty days previously. After explaining the formation of these tables, and detailing the conclusions derivable from them, the author gives a sketch of the perturbing causes, such as oceanic evaporation, mountain ranges, and other local influences; he then enters into a discussion of the mathematical expression for the daily heat; and he concludes with some observations on the theories of temperature and isothermal lines, as affected by the electrical and magnetical conditions of the earth, dependent on its rotation on its axis.